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IN THE

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ALFALFA SEED PRODUCTION IN THE PRAIRIE PROVINCES

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The production of alfalfa seed in the Prairie Provinces of Canada started in the irrigation districts of southern Alberta near the town of Brooks. Sometime later the center of production shifted to the northern areas of all three provinces where most of the seed is now grown. Alfalfa hay is an important crop in irrigation districts but only a limited acreage of seed is harvested now, and this is located in areas adjacent to dry prairie. Although very little seed is grown outside of these general areas a wider distribution of production is desirable. Excellent crops of alfalfa seed can be grown in almost every district in Manitoba, Saskatchewan, and Alberta provided that conditions for pollination are favorable.

Recently the acreage of alfalfa for seed has tended to level off or even decrease. In older districts it has been replaced by cereal crops or, if a legume is necessary in the rotation, by sweet clover and red clover. This trend has been caused by wide fluctuations in seed yield, which in turn have been influenced by factors such as a decrease in populations of pollinating insects, by the ravages of injurious insects, and by normal variations in climate. A very good yield of alfalfa seed is 200 to 300 pounds per acre, and authentic records of over 1,000 pounds are known. However, an average yield over a period of years probably will approach 200 pounds per acre under good crop management. Fortunately, research on the causes of variable seed setting has made good progress. The seed grower can now obtain information that will ensure a profitable return over a period of years, even though near failures may occur in certain seasons.

The Effect of Climate

The climate of the Prairie Provinces largely prevents early grazing or cutting for hay in the year that a crop of seed is taken. In southern Alberta and southwestern Saskatchewan these practices may be possible and desirable to make the flowering period coincide with the time when pollinating insects are most numerous. In northern districts, however, the growing season is barely long enough to permit seed to ripen if the crop is not cut or grazed and any treatment that delays maturity even for a few weeks is almost certain to cause a seed failure. However, an alternative crop of hay may be cut about mid-July if it is decided then that the potential seed crop is not likely to be profitable.

Favorable weather factors include a good supply of moisture in the spring and early summer along with reasonably high temperatures so that the plants start flowering in late June or early July. During July and early August practically all of the flowers are set that will make mature seed. In that period, warm, sunny days with maximum temperatures of about 70°F. or higher are

necessary. Continuing high temperatures through August will carry a large proportion of the seed to maturity. However, even though favorable weather occurs throughout the season a good seed yield is not assured unless the hazards of poor pollination, injurious insects, diseases and lack of soil fertility are avoided.

Climatic hazards are largely unavoidable. Thus spring frosts may delay growth and flowering, and a June frost may destroy bloom and force a late crop. Hailstorms can cause extensive damage and cool wet weather in July may prevent pollinating insects from working the flowers. A lodged growth will set poorly but can be avoided to some extent by thin seeding. High winds do not pollinate alfalfa and may cause seed losses by interfering with the work of pollinating insects during the flowering period.

Pollination

The alfalfa flower must be cross-pollinated by insects in order to set seed. Self-pollination, or inbreeding, results in very little seed. Finally, tripping of the flower must occur before fertilization can take place. Occasional flowers may be tripped by very high temperatures, or by light frosts or hail storms, but they will not be cross-pollinated.

Honeybees freely visit alfalfa for nectar, but in doing so they rarely trip the flowers and thus have little or no effect on seed setting. If honeybees can be forced to visit alfalfa for pollen they will set considerable amounts of seed, and this is the basis of alfalfa seed setting in the southwestern United States. This means, however, the elimination of competing flowers. Honeybees much prefer to obtain pollen from sweet clover, dandelion, sow thistle, wild mustard, rapeseed, fireweed, and various other plants. Since these sources of pollen are abundant almost everywhere it is unlikely that honeybees will ever play an important part in alfalfa seed production in the Prairie Provinces.

The beneficial insects that are of prime importance to the alfalfa seed grower are certain species of bumble bees and leaf-cutter bees. Bumble bees are familiar to almost everyone and generally do a good job of tripping and pollinating alfalfa flowers. These bees nest in old mouse nests, piles of trash, thick layers of grass or debris, and in other similar locations. Cultivation largely destroys their nesting sites. Perhaps even more effective in alfalfa pollination are wild leaf-cutter bees. They are dark-colored insects about the size of honeybees and may easily be overlooked or mistaken by the untrained observer. Leaf-cutters commonly nest in tunnels in the ground or in dead wood. In wooded areas tunnels left by the larvae of wood-boring beetles in dead logs or stumps are favorite sites. In the same areas the ground-nesting species may occur, especially on sandy soils. On the prairies the ground-nesting species are found nesting in undisturbed sod. Like bumble bees, leaf-cutters are never abundant where all or almost all of the land is cultivated. Attempts have been made to get these wild bees to use artificial nesting sites but so far no method useful to the seed grower has been developed.

Location and Size of Field

The first consideration in the location of an alfalfa seed field is the probable abundance of wild bees. An adjacent area of woodland, prairie, or pasture is essential and the larger this area is in proportion to the size of the field the greater is the potential seed set. Since the population of wild bees is limited,

enlarging the size of the alfalfa field will only spread them more thinly. However wild bees, and especially leaf-cutters, obtain both pollen and nectar from alfalfa. Thus they may increase in subsequent years because of an abundant food supply, provided of course that their nesting sites are maintained.

In most districts the size of the alfalfa field probably should range from 5 to 25 acres, depending on the acreage of undisturbed land nearby. Shape is important also and, since wide fields usually show heavier setting along the margins, long narrow fields are preferred, with the long axis parallel to the bee-nesting area. Where a large area of unbroken land is being prepared for seed production, it is suggested that the land be broken and seeded in strips of 10 to 15 rods in width. Probably not less than one-half and up to three-quarters of the area should be left unbroken.

The soil type is not usually important in locating the field. Excellent stands of alfalfa are grown on sands, loams, and heavy clays. An adequate moisture supply is necessary. It may be obtained from normal rainfall, surface or sub-irrigation, or by planting the crop in spaced rows. If the water table is not more than 10 to 15 feet from the surface the alfalfa roots can be expected to penetrate to it. Soils to be avoided are those that are poorly drained or too high in alkali salts to grow normal crops of cereals. Locations likely to flood for more than about 10 days in the spring or two or three days in hot weather should not be chosen.

Care should be taken to avoid land contaminated with weeds that may persist to harvest time. Sweet clover is a particularly bad contaminant since no cleaning process will separate the seed from alfalfa seed. Thus it is wise to avoid land where sweet clover is likely to volunteer. Other weeds such as Russian pigweed, Russian thistle, stinkweed and American dragonhead are commonly found in alfalfa. They can be largely eliminated by suitable cultivation or by chemical herbicides, as will be discussed later.

Where it is planned to produce Approved, Registered or Certified seed it is necessary to provide isolation from other alfalfa fields. It is also essential that all alfalfa be eradicated from the field and its borders before seeding. This may affect the choice of location. If the crop is to be registered, present regulations require an isolation distance of 100 yards if the field exceeds five acres in area and 150 yards if it is five acres or less. Requirements for approved stock seed are 200 yards and 300 yards. Land broken out of alfalfa should be left in cereal crops or summerfallow for at least three years to destroy all old plants and volunteer seedlings. This is a good practice anyway since old alfalfa fields have used up the subsoil moisture and a few seasons in more shallow-rooted crops are needed to build up the water levels. Growers who plan to grow seed for registration are required to belong to the Canadian Seed Growers' Association, and are advised to write to the Canadian Seed Growers' Association, Ottawa, Canada, for further information.

Choice of Seed and Variety

Only sound seed of high germination should be sown. It should be free or almost so from weed seeds, especially those kinds that do not occur where the crop is to be grown. It is also important to purchase seed grown in Western Canada. Tests at the Forage Crops Laboratory have shown that Grimm alfalfa from seed grown in Western Canada is decidedly more winter hardy than Grimm from seed produced in the United States.

It is advisable to inoculate alfalfa seed, especially if it is sown on new land. Land that has grown alfalfa or sweet clover before may contain natural

inoculum but it is unwise to depend on this. Not all legume bacteria are beneficial and some may actually cause harm. Pure cultures are made up from selected strains and can be relied on to give good results. The inoculum is easily applied and full directions come with each container. Sufficient to inoculate 60 pounds of seed can be purchased from any seed dealer for about 70 cents.

The choice of a variety depends on factors such as hardiness, disease resistance, and markets. A brief discussion of adapted varieties suitable for seed production follows:

GRIMM. Grimm alfalfa has been the main variety grown for seed since the beginning of the industry. The seed yield is good and the variety is winter hardy. Unfortunately it is not resistant to bacterial wilt and this has greatly reduced the market for Grimm seed in the United States. While considerable amounts of Grimm seed will continue to be sold for some time, the variety appears to be on its way out. Seed growers should consider changing to newer or more popular varieties such as Ladak, Rambler and Vernal.

LADAK. This is the recommended variety for hay in the Prairie Provinces. Seed yields are similar to those from Grimm. It is winter hardy and somewhat resistant to bacterial wilt. Stands will last a year or two longer than those of Grimm on wilt-infested soils. Ladak seed sells for a slight premium over Grimm and growers are advised to change to it in preference to Grimm.

RAMBLER. Rambler was released by the Experimental Farm, Swift Current in 1955. It is extremely winter hardy, more drought-resistant than any other variety, and is similar to Ladak in resistance to bacterial wilt. Hay yields are high for the first cutting but much lower for the second since Rambler recovers more slowly than other varieties. It spreads by underground roots and is especially suitable for dryland pastures. Rambler is expected to become an important variety particularly in the drier areas where its drought resistance and persistence under grazing are especially valuable. Seed yields have been lower than those from Grimm or Ladak. However the seed has a large potential market and undoubtedly will sell at a good premium for some years to come.

RANGER. This variety was released from the University of Nebraska in 1942 and has become widespread in the United States because of high resistance to bacterial wilt. It is not recommended in Canada because of low forage yield and some lack of winter hardiness. Seed yields are good but stands may kill during severe winters.

RHIZOMA. Rhizoma was selected at the University of British Columbia for the spreading root habit of growth. It does not show this characteristic under prairie conditions. Rhizoma produces good yields of hay and seed and is winter hardy. It appears to have special adaptations in Eastern Canada and the northeastern United States. The variety has no resistance to bacterial wilt.

VERNAL. Like Rambler, Vernal is a very new variety and was released by the University of Wisconsin in 1953. It is highly resistant to bacterial wilt and in tests across Western Canada it has proved to be the equal of Ladak in forage yield. The winter hardiness of Vernal appears satisfactory and approximately equal to Ladak. Seed yields have been in the same range as those for Grimm and Ladak. Vernal seems to be a good prospect for the alfalfa seed grower. The variety is well adapted in Canada and reports from the northern United States are good.

Obtaining a Stand

Alfalfa must not be seeded too deep. A depth of one-half to one inch is best although one and a half inches is satisfactory on sandy soils. If the soil is very loose it should be packed and even then some method of depth control may be necessary for drilled seedings. For uniform and quick germination the seed should be sown into a moist firm seedbed. In preparing the seedbed it must be remembered that the young alfalfa seedling does not compete well with weeds and that it is easily damaged by drifting soil. Summerfallow is recommended wherever soil drifting is not a hazard. A light cultivation with a disk or spring-tooth harrow will kill annual weeds and leave the land in good condition for either drilled or broadcast seeding. Harrowing followed by packing is recommended after seeding especially if the seed is broadcast or the soil is loose.

In areas where soil drifting is a problem clean stubble land is preferred. If the seed is sown just before freeze-up or before growth starts in the spring it usually can be seeded directly into the stubble without previous cultivation. If seeding is delayed until weeds have germinated or if the soil is too hard for the drill to penetrate to the proper depth, then cultivation before seeding is necessary. Again, the disk or spring-tooth harrow will do a good job.

The time to seed alfalfa varies in different parts of the Prairie Provinces. In the Black and Gray Wooded soil zones seeding can be successful up to about July 1 and may even succeed as late as August 1. In drier areas, particularly in the Brown soil zone, seeding should be done as early in the spring as possible so that the alfalfa will be well rooted before the hot, dry weather of midsummer. Early fall seeding into grain stubble about September 1, is recommended in southern Alberta. In all other areas early fall seeding is not advisable as the young seedlings do not become well established before winter sets in and are likely to winterkill. Although early spring seeding usually is preferable, late fall seeding just before freeze-up is often successful especially on soils likely to develop a hard crust. The seeding must be late enough so that germination does not occur until the next spring.

Seeding with a grain drill is common practice and is the only method likely to give good stands in the drier areas. If a nurse crop is used the alfalfa should be seeded in a separate operation, or else the nurse crop sown at the depth recommended for alfalfa. With new drills it may be possible to seed alfalfa alone at the recommended rate but most growers prefer to mix the seed with cracked grain from which the finer particles have been sifted out. A small amount of live grain, about 10 pounds per acre, may be mixed with the alfalfa without causing any serious competition even if it germinates well. The best method, of course, is to use a grain drill with a grass seeder attachment.

Broadcast seeding is still popular in northern districts. Usually a hand-powered Cyclone seeder is used to distribute the seed. It is advisable to sow one-half of the seed in one direction and the other half at right angles to get even distribution. Broadcast seeding ordinarily requires a heavier rate of seeding than drilled seeding. It should always be followed by a packer or a drag harrow. A nurse crop usually is seeded before the alfalfa.

A seeding rate of eight to ten pounds per acre is recommended for a hay crop but it does not give the best seed yields. On the other hand a stand that is too thin may be invaded by weeds and native grasses. There are about 220,000 seeds in a pound of alfalfa. This means that a rate of one pound per acre would apply about five seeds to the square foot. This would be sufficient under ideal conditions but, in practice, a rate of four to six pounds per acre

is necessary to allow for seed that does not germinate or become established as mature plants. If the crop is grown in rows spaced two and a half to three feet apart a rate of about two pounds per acre is sufficient.

Whether or not to use a nurse crop depends almost entirely on moisture conditions. In the Brown and Dark Brown soil zones a nurse crop is not recommended since the alfalfa seeding is likely to fail except in unusual seasons. In northern districts, however, a nurse crop is almost always seeded, and with generally good results. Flax is probably the best since it allows more light penetration than the cereal grains. If oats, wheat, barley, or spring rye are seeded they should be sown at about one-half the usual rate to prevent excessive competition and shading. It is advisable to seed an early maturing variety or else to cut the nurse crop for cereal hay, so that the alfalfa will have an opportunity to make good growth during the fall months.

The Use of Fertilizers

A lack of phosphorus may occur on the older irrigated soils in southern Alberta. The deficiency can be corrected by an application of 100 pounds to the acre of ammonium phosphate 11-48-0. In all other areas the only known deficiency is sulphur and it occurs only on the gray wooded soils. Sand or sandy loam soils are most likely to be affected but heavier soil types may lack sulphur in some districts. The symptoms of sulphur deficiency are a pale-green or yellowish color and a stunted, unhealthy appearance.

Several fertilizers are equally effective in correcting sulphur deficiency. Gypsum at 40 to 50 pounds per acre is much the cheapest, but is finely ground and floury and a special spreading machine is required. Other recommended fertilizers containing sulphur are: ammonium phosphate 16-20-0 at 50 to 75 pounds, sulphate of potash at 40 pounds, and ammonium sulphate at 35 pounds per acre. They are more costly than gypsum but can be broadcast, or spread with the type of spreader ordinarily used to apply fertilizer to cereal crops. The best time to apply the fertilizer is in late fall before freeze-up or as early as possible in the spring. On established stands the fertilizer can be drilled in but it is usually broadcast on the surface. The best practice is to apply the fertilizer annually at the recommended rates. Heavier rates will give residual effects but may cause excessive growth and lodging in the year of application. Ammonium phosphate 16-20-0 at 75 to 100 pounds per acre may be applied with the nurse crop when alfalfa is seeded down. This treatment supplies nitrogen and phosphorous for the cereal crop and sulphur for the alfalfa. Ammonium phosphate 11-48-0 is commonly used on cereals but it contains only a trace of sulphur and is not recommended for alfalfa. Barnyard manure contains some sulphur and an application on established stands of alfalfa will benefit the crop. However, care should be taken to avoid introducing weeds in this way.

Control of Pests

Injurious insects: Many insects may cause reductions in alfalfa seed yields. However, the most common and generally destructive are alfalfa plant bugs and grasshoppers.

Alfalfa plant bugs include lygus bugs and several other species that cause similar damage and symptoms, and for which similar control measures can be used. They are sucking insects and feed upon the growing parts of the plant such as the flower buds and developing pods and seeds. Their presence

in quantity is indicated by blasted buds (yellowish-gray buds that do not open); large numbers of stripped racemes caused by flowers and small pods dropping, and by large numbers of brown and shrivelled seeds. Under severe infestation the plants may be stunted and unthrifty.

Some species of plant bugs overwinter in the egg stage. They can be destroyed by burning the alfalfa stubble early in the spring. Lygus bugs overwinter as adults. However, spring burning delays and concentrates their egg-laying and makes chemical control more effective at a later date. Avoid burning off areas adjacent to alfalfa fields as this may destroy the wild bees that are necessary for pollination.

Chemical control with insecticides is effective. Alfalfa plant bugs are so widespread that there probably is no alfalfa seed field that could not be profitably sprayed or dusted. The recommended treatment is to apply sufficient spray or dust to supply three-quarters of a pound per acre of DDT. The DDT should be applied about June when the alfalfa is in bud but before many flowers appear. If the treatment is not fully effective, or if it is not possible to spray at the time suggested, a later spraying in July is advised. At this time the DDT should be applied in the evening or early morning when bees are not at work. Fields treated with DDT must not be pastured or cut for hay.

Grasshoppers may cause extensive damage to an alfalfa seed crop especially by cutting the slender pedicels on which the pods are borne. Aldrin, chlordane, heptachlor, and toxaphene are grasshopper poisons suitable for use in sprays, dusts, and baits. In sprays and dusts these poisons have both contact and stomach poisoning properties and should be applied if possible both to the grasshoppers and to the alfalfa. They should be applied according to the directions and at the rates shown on the container. While all of the above poisons are effective, damage from grasshoppers usually is noticed when the alfalfa is in flower. At this stage, toxaphene is recommended as it has the least effect on pollinating insects. Fields treated with chemicals to control grasshoppers should not be grazed or cut for hay within three weeks after treatment.

Diseases: There are three diseases of alfalfa that are of primary importance—bacterial wilt, winter crown rot, and blackstem.

Bacterial wilt first infects the root system. If the taproot is peeled back or cut in cross-section a straw-yellow or brownish discoloration will be seen between the bark and the woody cylinder. Top symptoms are a dwarfed habit of growth with an abnormally large number of small stems. These dwarfed plants are pale green or yellowish in color and the leaves are smaller than usual. In hot weather badly infected plants will wilt and die.

The disease is common on irrigated land and on the black soils of Alberta and Manitoba. It occurs occasionally across northern Saskatchewan, but is not a problem in dryland districts. A susceptible variety such as Grimm usually will produce two or three good crops on infected land. The stand will then be too thin and patchy to be profitable. The only effective control is a resistant variety like Vernal which will persist for many years on wilt-infested soil. Ladak is partially resistant and will last a year or two longer than Grimm.

Winter crown rot is found throughout the Prairie Provinces but is especially destructive in northern districts. Affected plants will show dark brown rotted areas on the crown and adjacent parts of the root. The disease develops at temperatures just above freezing and damage becomes evident when growth starts in the spring. Killing usually starts from individual plants or small

patches and these are a starting point from which the disease may spread in later years. Grass, dandelions, and other weeds quickly move into the bare areas. In many districts alfalfa fields usually are plowed after four to five years in crop because of the ravages of winter crown rot. In 1942 conditions for the development and spread of the disease were particularly favorable and it is estimated that about one-half of the alfalfa acreage in northern Saskatchewan was killed or so badly damaged that the stands had to be plowed. A similar epidemic occurred in Alberta in 1943. Winter crown rot damage frequently is confused with killing from low temperatures. True winterkilling, however, affects the entire root system and the root quickly becomes soft and mushy. Winter crown rot killing affects only the crown and upper part of the root. Thus the root may remain green and firm on into late spring or early summer, even though the top growth has been completely destroyed.

None of the common varieties of alfalfa has any appreciable resistance to winter crown rot and no practical control measure is known other than crop rotation. Fields infected with the disease should be left in annual crops or summerfallow for at least three years after breaking from alfalfa. This allows the fungus to die out so that new stands of alfalfa will not be infected. Removal of straw and debris from the field in the fall has reduced infection the following spring. However this practice conflicts with spring burning which is an important control measure for injurious insects and for the blackstem disease.

Blackstem is a common disease on the leaves and stems of alfalfa and is most prevalent in northern districts. The disease is favored by cool, wet weather in the spring and fall and is not important where temperatures are high and humidities low. The young alfalfa shoots are attacked in the spring and many of them may be killed at that time. The disease later spreads up the plant and light brown to deep black lesions develop on the leaves, stems and even on the growing seed pods. Sometimes the stems are entirely blackened. Infected leaves drop prematurely and thus deprive the plant of food supplies needed to mature the seed crop. It is not uncommon to find seed fields almost completely defoliated in mid-August when large amounts of immature seed are present.

No resistant varieties are available and at present there are no fungicides that can be recommended. The best control is field sanitation. Spring burning removes much of the source of infection by destroying growth from the previous year. After burning (or if burning is not possible) the field should be cultivated before growth starts. The best implement is a narrow, stiff-toothed cultivator. A spring tooth harrow is satisfactory on lighter soils. Cutting implements of the disk type should be avoided because of the damage they do to the crowns. Cultivation should be to a depth of one to one and a half inches and two or three treatments from different directions may be necessary. Spring cultivation not only limits the disease but also assists in weed control and is an excellent cultural practice to follow the broadcast application of fertilizers.

Several other leaf and stem diseases affect alfalfa and can be severe in local areas. Yellow leaf blotch and common leaf spot are examples. In general the control measures recommended for blackstem are effective.

Weeds: Alfalfa for seed production should be seeded on clean land. A certain population of annual weeds is unavoidable but land infested with perennial weeds such as sow thistle, Canada thistle, couch grass, leafy spurge, hoary cress, and Russian knapweed should not be seeded. The control of annual weeds and sweet clover in alfalfa is important. They may not compete

seriously with the alfalfa but the weed seed content of the harvested crop may be high enough to have the seed degraded or even rejected when it is graded for sale.

Land likely to volunteer much sweet clover should either not be seeded to alfalfa or else should be cut for hay in the first crop year. Occasional plants of sweet clover should be pulled by hand. They are conspicuous in an alfalfa field and thus easily located.

Cultivation as described for the control of blackstem helps to control invading grasses and perennial weeds in older stands. It also aids in the control of annual weeds such as Russian thistle, Russian pigweed, stinkweed, and lamb's quarters.

Chemical control of annual weeds has possibilities. Alfalfa is partially resistant to 2,4-D and MCP but care must be taken to avoid applying them on the growing crop or the alfalfa may be severely injured or killed. Susceptible weeds in a nurse crop underseeded with alfalfa can be killed with MCP amine at 2 to 4 oz. acid equivalent per acre or MCP sodium salt at 3 to 6 oz. per acre. Selective dinitro compounds are effective at 12 to 20 oz. per acre in 80 gallons of water if applied on a warm, sunny day. The alfalfa is most resistant at about the second-true-leaf stage and should be treated then. Do not treat with chemical unless the alfalfa stand is thick and vigorous and the weed infestation serious.

Established stands of alfalfa (after the seeding year) can be treated to control annual weeds such as Russian pigweed and lamb's quarters. Heavy rates (8 to 16 oz. per acre) of 2,4-D or MCP ester should be applied early in the spring before the alfalfa has started to grow. If the alfalfa shoots are about one inch long the rates should be reduced and no treatment is recommended when the alfalfa is about three inches high.

Harvesting, Threshing and Cleaning

The seed crop is ready to harvest when about three-quarters of the seed pods have turned brown or black in color. This is usually about the end of August or early in September in northern areas, and one to two weeks sooner in the south or in early seasons. If the crop is to be straight combined it can be left until practically all pods are ripe or until killing frosts have dried out the stems. Ordinarily alfalfa does not shatter its seed readily. However, some loss may occur in cloudy, wet autumns when there may be much alternate wetting and drying of the mature pods. If the crop is handled when very dry much loss can occur from ripe pods breaking off. Thus it is recommended that swathing or harvesting with a grain binder be done when the crop is damp from dew or rain.

Various methods of harvesting are practised. The use of a binder and threshing machine was very common at one time and is still followed by a number of growers. Another method is to windrow with a windrowing attachment on a mower or to swath with a grain swather. The windrows or swaths are then threshed by a combine with a pick-up attachment. Perhaps the most widely used method is to straight combine when the crop is fully mature. All the above methods give satisfactory results and the one chosen will probably depend on the equipment the farmer may have and his personal preferences. The binder and the swathing methods have the advantage of saving some almost mature seed if the crop is cut just before a heavy frost. On the other hand, if the weather continues favorable immature pods may

ripen and thus increase the yield from straight combining. Heavy losses may occur if newly laid swaths or windrows are exposed to high winds.

Alfalfa is not difficult to thresh if the crop is dry and the machine adjusted properly. The rub-bar type of cylinder is preferred because it does not break up the stems excessively and thus the return elevator is not clogged so easily. For spike-toothed cylinders, corrugated teeth will give the most satisfaction. The concaves should be set up close and the cylinder speed increased slightly. The wind blast should be adjusted as necessary to remove light material and yet prevent loss of seed.

A heavy rate of feeding into the cylinder should be avoided even if the crop is dry. For combines, a slow forward speed is recommended to ensure clean threshing and to avoid loss of seed.

Commercial and government seed cleaning plants are located at various points in the West. It usually pays the grower to have his seed cleaned by these concerns since up-to-date and expensive cleaning machinery is necessary to remove weed seeds that are difficult to separate from alfalfa. However, seed can often be cleaned successfully on the farm with an ordinary fanning mill. Proper screen size is important and will depend somewhat on the plumpness of the seed and the amount of clean-out to be tolerated. For the upper shoe a 1/13, 1/14 or 1/15 zinc screen is recommended. The corresponding sizes for the lower shoe are 1/18, 1/20 or 1/22 zinc screen or 18 x 18, 19 x 19 or 20 x 20 wire screen.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P., Queen's Printer and Controller of Stationery, Ottawa, 1956.